DS-E Series UPS 10KVA

User Manual

【NOTE】

Please carefully read the user's manual before operation for the sake of understanding correct operation of the instrument. Please keep the manual handy for future reference.

WARNING
The input and output of the instrument is with danger high voltages which may endanger the safety of life. Please strictly follow the operating description is not allowed to remove the cover of the instrument.

1. Please connect protective earth before power supply cables.
2. The input & output voltage of the UPS is dangerous which will endanger the safety.
3. Dangerous voltages are present inside the unit. Please do not open the cover of the UPS.
4. Please turn off the mains input switch and the battery switch for any urgency.
5. There are many kinds of power sources in the equipment, the line bank or the socket may still have dangerous voltage even if the main power is disconnected.
6. Please remove the cable between the battery & UPS before repairing. It's necessary to wait for another 5 minutes for discharging, because of the dangerous voltages.
7. The wires should be fastened to the terminals. It is prohibited to short the anode and cathode of battery. It's prohibited to touch any two of wire connectors or bare end of connecting wires. Otherwise, it may lead to damage of battery or personal injury.
8. Please keep the battery away from the fire and all the equipment that may cause spark to prevent the danger and damage.
9. Please do not open or shatter the battery, the overflow electrolyte is with causticity that may be harmful to life.
10. Please contact the professional personnel of the local dealer or the special maintenance station for any trouble-shooting. Random disposal of the trouble is not allowed.
11. This is an A-grade product with electromagnetic compatibility.
12. This equipment must be installed and serviced by qualified personnel.
13. Before usage, confirm that the temperature of the instrument has dropped into the normal run range. It is recommended still placement for 24 hours in the normal temperature range before startup.
14. Before you replace the battery of different brand and different type, make sure the charging voltage is matching with UPS charging voltage due to the different required charging voltage of different battery, If any doubt, please consult with the manufacturer. Any changes of the system configuration, structure and composition will influence the performance of UPS, please consult with the manufacturer in prior before doing any changes.

Index

1. Overview 1
1.1 Model Meaning Explanation 1
1.2 Abstract of Product 1
1.2.1 Product Feature 1
1.2.2 Technical Specification 3
2. Basic Principle and Structure 5
2.1 Principle 5
2.1.1 Principle Diagram 5
2.1.2 Principle 5
2.1.3 Work Process 6
2.2 Structure 8
2.2.1 DS10000E Display Interface 8
2.2.2 DS10000E General Structure 9
2.2.3 DS10000E Line bar and Air-break Switch 11
3. Transportation and Storage 12
3.1 Transportation 12
3.2 Storage 12
4. Installation 13
4.1 Installation Notice 13
4.2 Site and Environment Requirements 14
4.2.1 Site Requirement 14
4.2.2 Environment Requirement 15
4.3 Unpacking 15
4.4 Power Examination 16
4.5 UPS Installation 16
4.6 Battery Group Installation 16
4.6.1 Important Security Regulation 16
4.6.2 Installation Process 16
4.7 Electrical Wire Connection 17
4.7.1 Switch Selection for Input 17
4.7.2 Selection of Input and Output Power Cord Diameter 17
4.7.3 Mode of Single Unit Connection 17
4.7.4 Mode of Serial Hot Backup System 19
4.8 System Examination 22
4.8.1 Electric Connection Examination 22
5. Operation 23
5.1 Notice 23
5.2 Startup Preparation 23
5.2.1 Load Capacity Calculation 23
5.2.2 Checks before Power-on 24
5.3 Operation of a Single UPS 24
5.3.1 First Startup 24
5.3.2 Daily Start-up and Shutdown 24

6. Maintenance Guard 25
6.1 Battery Maintenance.....25
6.1.1 Daily Maintenance.....25
6.1.2 Battery Changing.....26
6.2 UPS Maintenance Guide.....26
6.2.1 Safety Precaution.....26
6.2.2 Periodic Preventative Maintenance.....27
6.3 FAQ.....27
6.3.1 Abnormal Problem Analyses.....27
6.3.2 Troubleshooting.....30
6.3.3 Emergence Measure for Single System.....31

1. Overview

1.1 Model Meaning Explanation

Model Meaning of UPS DS10000E

"DS10000E & DS10KE31" means the product is high-frequency UPS of DS-E Series. "KE3" means that the phase of power input. "10KE31" means that the output power is 10KVA with signal-phase.

1.2 Abstract of Product

1.2.1 Product Feature

DS10000E series UPS are on-line-UPS of sine wave charactering high-performance, designed for network computer room, small intelligent equipments like measure devices or industrial auto-machines etc. and exact instruments used in systems such as finance, communication, insurance, railway, hospital, mine and enterprise etc, specially for terrible electric network circumstance.

DS10000E series UPS, the on-line-UPS of sine wave **c**haractering high-frequency has mainly the following features:

- **Great adaptability for power input**
  The input voltage range can be wide even to 120~276Vac, in which there is no need for battery inversion that can availably protect batteries.

- **Precise synchronization system with commercial power**
  The realization of exact zero-phase synchronization between output and input can meet the requirement to synchronization of power supply and electric network from a variety of instruments, being propitious to improve user system performance and boosting the reliability of bypass switch.

- **High input power factor**
  Adopt advanced active PFC technique, which alleviates load on electric network and represents green power supply of new generation.

- **High performance-price ratio**
  Adopt multiple power transfer and high frequency PWM technique, character high efficiency, small size and light weight, improve running reliability and reduce manufacturing cost. All above help decreasing customer cost of system designation.

- **Low running input voltage**

Independent fast-test technique adopted leads to no inversion of DC/DC module even when input voltage lows to limit 120V so that all the output energy under the commercial supply status is transferred from electric network that can guarantee the batteries are in 100% energy-storage status and decrease battery-discharge number to prolong life.

- **Perfect protection function**

  Functions designed such as output low-voltage protection, battery low-voltage protection, current overflowing protection, fast current-limit, short-circuit protection etc are able to avoid faults caused by manual operation mistake to guarantee reliable work in different conditions.

- **Intelligent RS232/485 communication (optional)**

  With RS232/485 standard data interface and dry-connector signal, supported by UPSilon 2000 power monitor software, the status of electric network and UPS can be directly inspected on the computer monitor. The product can also support KELONG® SNMP network adaptor which will convert the UPS as fresh blood of network immediately, realizing network administration and improving system reliability.

1.2.2 Technical Specification

Table 1-1DS-E Series 10KVA Technical specification

Index \ Model		DS10000E	DS10000EL	DS10KE31	DS10KE31L
Input Characteristic	Rating voltage (V)	120~276Vac half full load 150~276Vac 75% full load 176~276Vac 100% full load			
	Working without other phase	----------		1、In condition without one of U and V phase ,the other two phase voltage between 176-276V ,UPS working with half load . The other two phase voltage between 120-176V, UPS working with 25 percent load. 2、In condition without U and V phase ,the other two phase voltage between 176-276V ,UPS working with 25 percent load . The other two phase voltage between 120-176V, UPS working with 13 percent load..	
	Rating frequency (Hz)	45-55/55-65 (setup when leaving factory)			
	Phase	Single-phase three-line		Three-phase five-line	
	Battery voltage (V)	240			
Output Characteristic	Capacity (VA)	10000VA/7000W			
	Voltage (V)	230±2%			
	Frequency (Hz)	50 or 60±0.1%（battery mode）			
	Waveform	Sine wave, THD < 3% (Linear load)			
	Switching time(ms)	0			
	Overload capacity	105%-130% rating load ,last 10min then turn into bypass 131%-150% rating load ,last 1min then turn into bypass Above150% rating load ,last 1 sec then turn into bypass			
	Output mode	Line bar			
Other Characteristic	Spare time	Optional			
	Charge recovery time	<24 小时（100AH a group）			
	Communication interface	RS232 interface supports UPS power management software and SNMP protocol			
	Warning function	Incorrect connection of phase-sequence to input , Battery low voltage protection, Commercial power abnormal, UPS fault		Battery low voltage protection, Commercial power abnormal, UPS fault	
	Panel display	LED displays operation status and parameter of UPS			
	Audio-noise (dBA)	<65			
	Protection function	Battery low-and-over-voltage protection, overload protection, short-circuit protection and excess temperature protection			
	Working temperature	0~40℃			
	Relative humidity	0~95%，No condensation			

	Size (mm) (W × D × H)	253×637×500	253×637×680	253×637×500	253×637×680
	Weight (Kg)	29	80	30	81

◆ **Specifications are subject to change without prior notice.**

2. Basic Principle and Structure

2.1 Principle

2.1.1 Principle Diagram

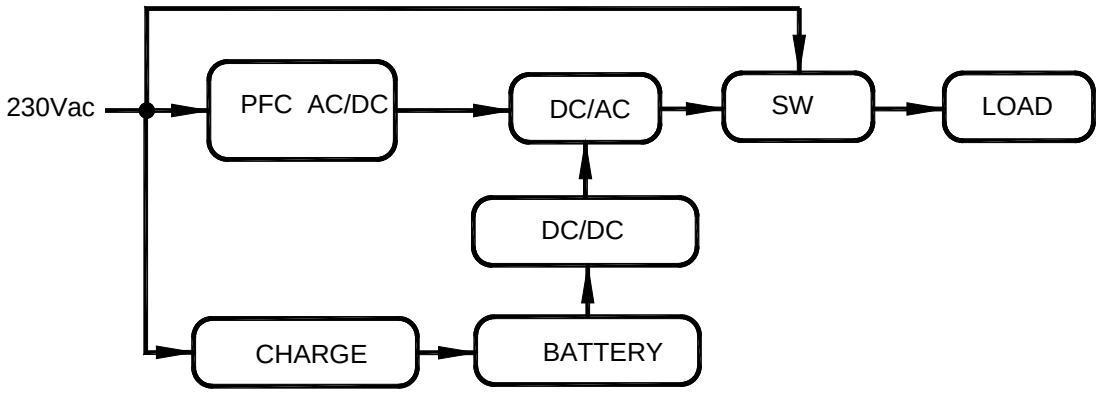

Fig.2-1 DS10000E Principle Diagram

2.1.2 Principle

UPS DS10000E is made up of PFC, AC/DC (Commercial power rectification and boost circuit), DC/DC (battery voltage-boost circuit), DC/AC inverter, switch, charger and battery group etc.

When commercial power is normal, through PFC, it can be boosted to ±350V stabilized DC supplied for DC/AC inverter to output steady 230V AC and finish battery charge at the same time. When commercial power is abnormal, through DC/DC, the battery voltage will be increased to ± 350V DC supplied for DC/AC inverter. Because of PFC and power-down fast-test technique adopted, even when the commercial power voltage lows to limit 120V, the battery group can still have no output current to assure battery longevity and be kept in energy-storage status and if commercial abnormal battery voltage-boost will start up at once to assure steady DC/AC output.

As information shown in the figure above, the DC/AC inverter adopts half-bridge structure, DC/DC module uses boost-circuit, PFC is active power-factor correction circuit controlled by UC3854 and CHARGER is a kind of complete isolation charger.

2.1.3 Work Process

When 230Vac normal, main DC circuit has DC voltage supplied for DC/AC AC-inverter which outputs stable 230Vac and charges battery at the same time. Whenever commercial power was low or broken down suddenly, the battery group would feed back electric power to DC circuit through DC/DC voltage-boost module until its energy used up. At the moment UPS would send out audio-light warning till battery voltage drop to the discharge limitation point then UPS would stop inversion and emit lasting sound. In addition, UPS has overload protection. When overload (125% full load) happens, UPS would turn to bypass supply and return if load recovers normal. When more serious overload (over 150% full load) appears, UPS would halt inversion and switch to bypass supply-at the time the switch may have jumped. After fault of load eliminated, as long as turn on the switch, UPS will restart to work again.

Audio-light warnings will always go with UPS when UPS abnormal. The warnings or protections are shown in detail in Table 2-1.

Table 2-1 The function of abnormal status and warning

UPS Status	Beep	Indicators On Panel	LCD Display	Protection /Warning
Normal	No beep	INV. On, Line on, Bypass off, Fault off, Output on	" Output Voltage 230.0 V "	No
105% overload	Once every 1.5 sec	INV. On, Bypass off, Fault off, Output on.	"Output 230.0V OVERLOAD "	Turn to bypass supply in 10 min
125% overload	Long beep	Bypass on, INV. Off, Fault on, Output on in 1 min	"Output 230.0V OVERLOAD "	Turn to bypass supply in 1 min
150% overload	Long beep	INV. Off, Bypass on, Fault on, Output on	"Output 230.0V LOAD PROTECT"	Protected
Low-voltage point	Once every 0.5 sec	INV. On, Line off, Bypass off, Fault off, Output on	"Output 230.0V BAT. LOW "	Waning
Battery voltage below protection point	Long beep	INV. Off, Line off, Bypass on, Fault on, Output off.	"Output 230.0V BAT. PROTECT"	Protected
UPS not wired to battery	No beep	INV. On, Line off, Bypass off, Fault off, Output on	"Output 230.0V BAT. FAIL"	No
Input breaker cutoff or input abnormal	Three beep with 100ms interval every 10 sec	INV. On, Line off, Bypass off, Fault off, Output on	"Output 230.0V LINE FAIL"	Warning

Over temperature	Long beep	INV. Off, Line off, Bypass on, Fault off, Output on	"Output 230.0V OVER TEMP"	Protected
Output over-voltage, Output low-voltage	Long beep	INV. Off, Bypass on, Fault on, Output on	"Output 230.0V UPS FAIL"	Protected
Short-circuit	Long beep	INV. Off, Bypass on, Fault on, Output on	"Output 230.0V OUTPUT SHORT"	Protected

Note: If commercial power recovers after low-voltage protection to battery, the product will restart and charge batteries.

2.2 Structure

2.2.1 DS10000E Display Interface

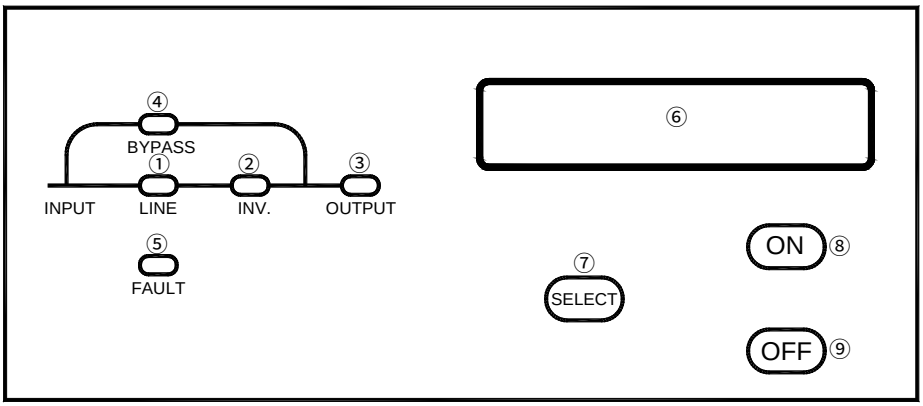

Fig. 2-2 DS10000E Display Interface

Illustration:

① "LINE" : When commercial power is normal, light on, abnormal off. When reverse connection of "L" and "N", light glittering.

② "INV." : Inverter normal, light on, abnormal off.

③ "OUTPUT" : UPS has output, light on; no output off.

④ "BYPASS" :UPS in status of bypass supply, light on; in status of inversion, off.

⑤ "FAULT" :UPS fault, light on; normal, off;

⑥ LCD Display

⑦ :Select" : When UPS normal, LCD displays normal output voltage. If the button pressed, the background light on and the LCD display will show input voltage, input frequency, output power, UPS status etc. In addition, when in battery inversion model, press the button for 2 sec, the interval beep can be cancel but warning audio in the status like battery low-voltage etc.

⑧ "ON" :When UPS is shutdown, press the button for 2 sec, UPS starts up. When UPS is running, press the button for 2 sec, UPS will enter battery test model. When battery voltage reaches the low-voltage point or test time last 10 sec, UPS will stop the function.

⑨ "OFF" :When UPS is running, press the button for 2 sec, UPS will shut down.

2.2.2 DS10000E General Structure

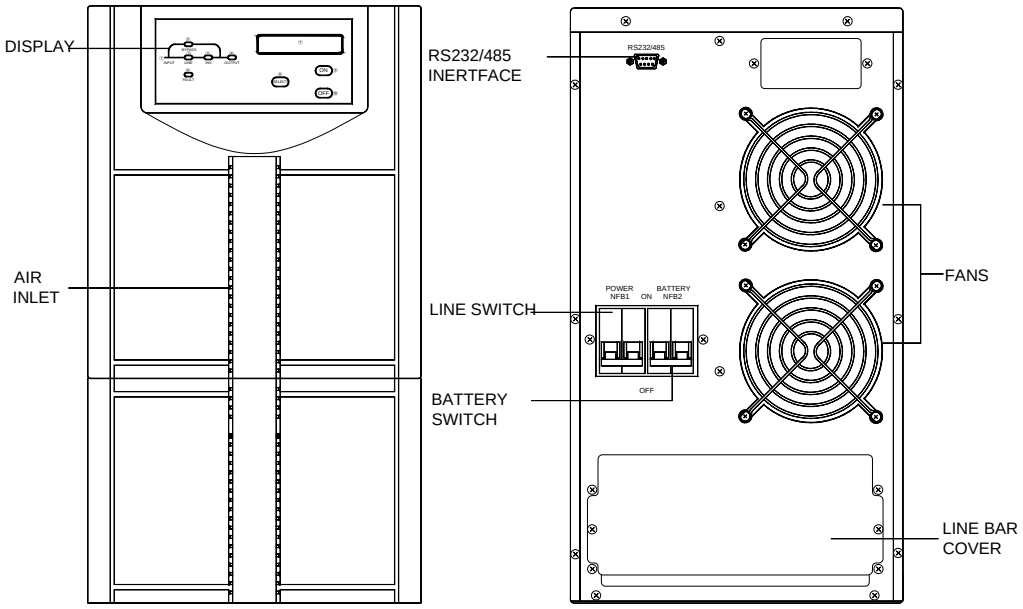

Fig.2-3 DS10000E Front Panel and Rear Panel

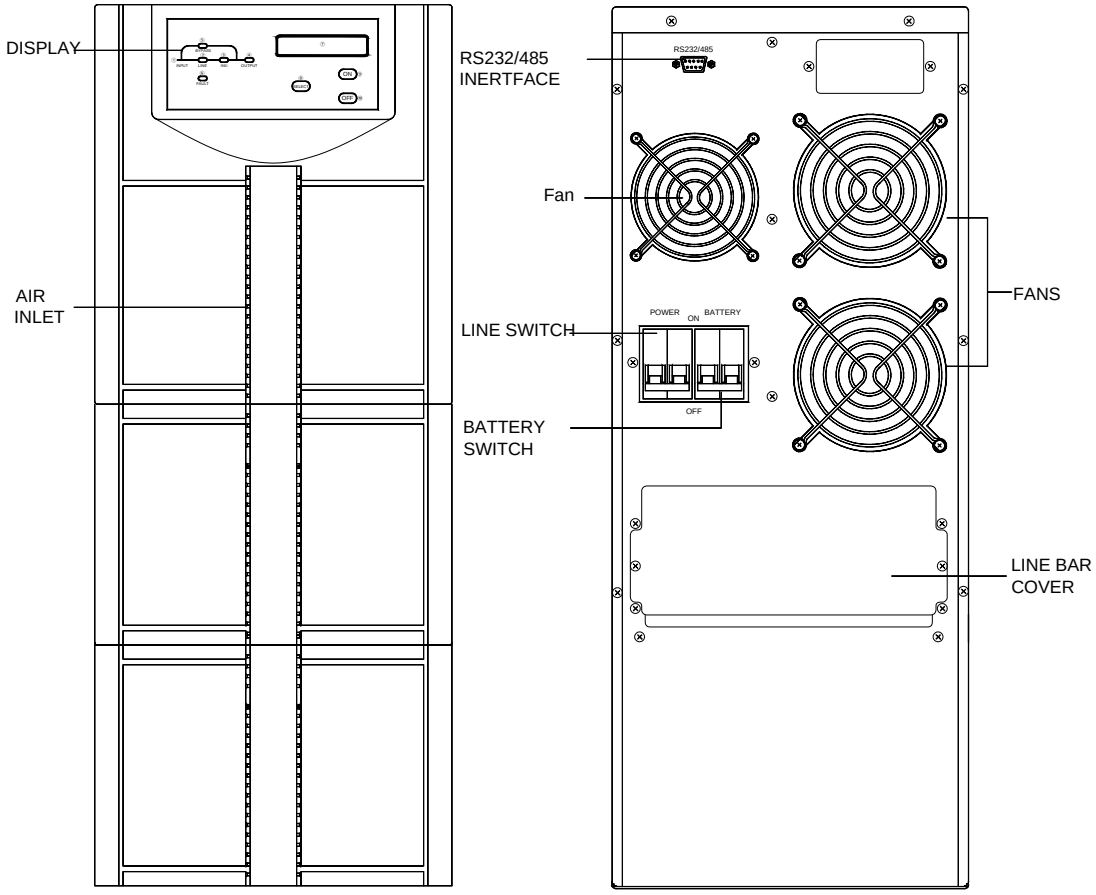

Fig.2-4 DS10000EL Front Panel and Rear Panel

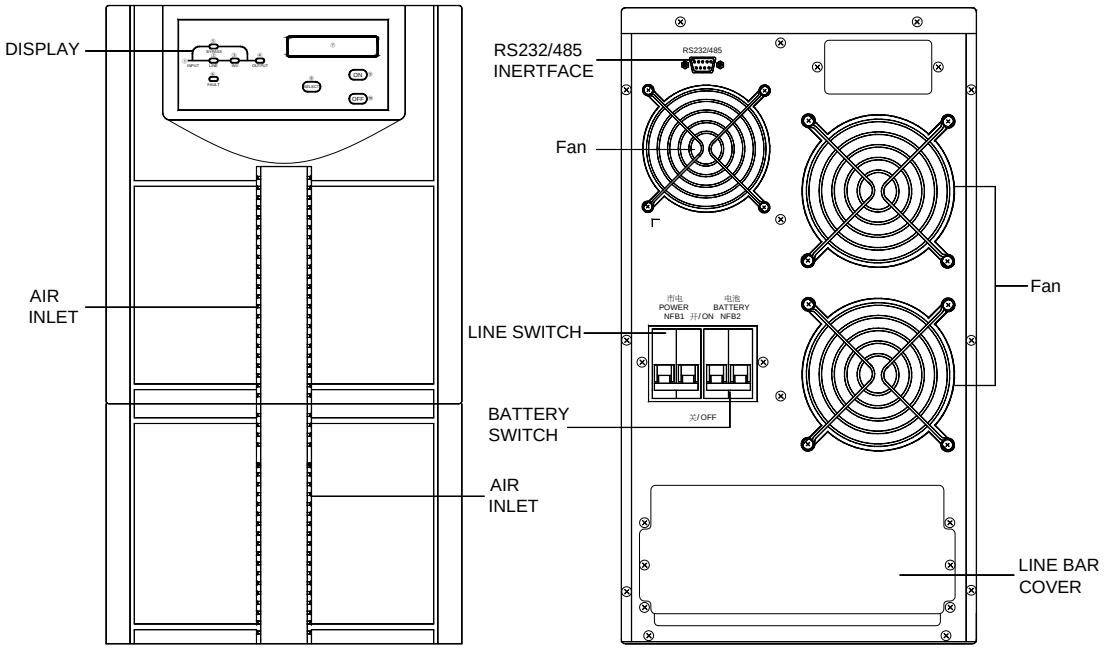

Fig.2-5 DS10KE31 Front Panel and Rear Panel

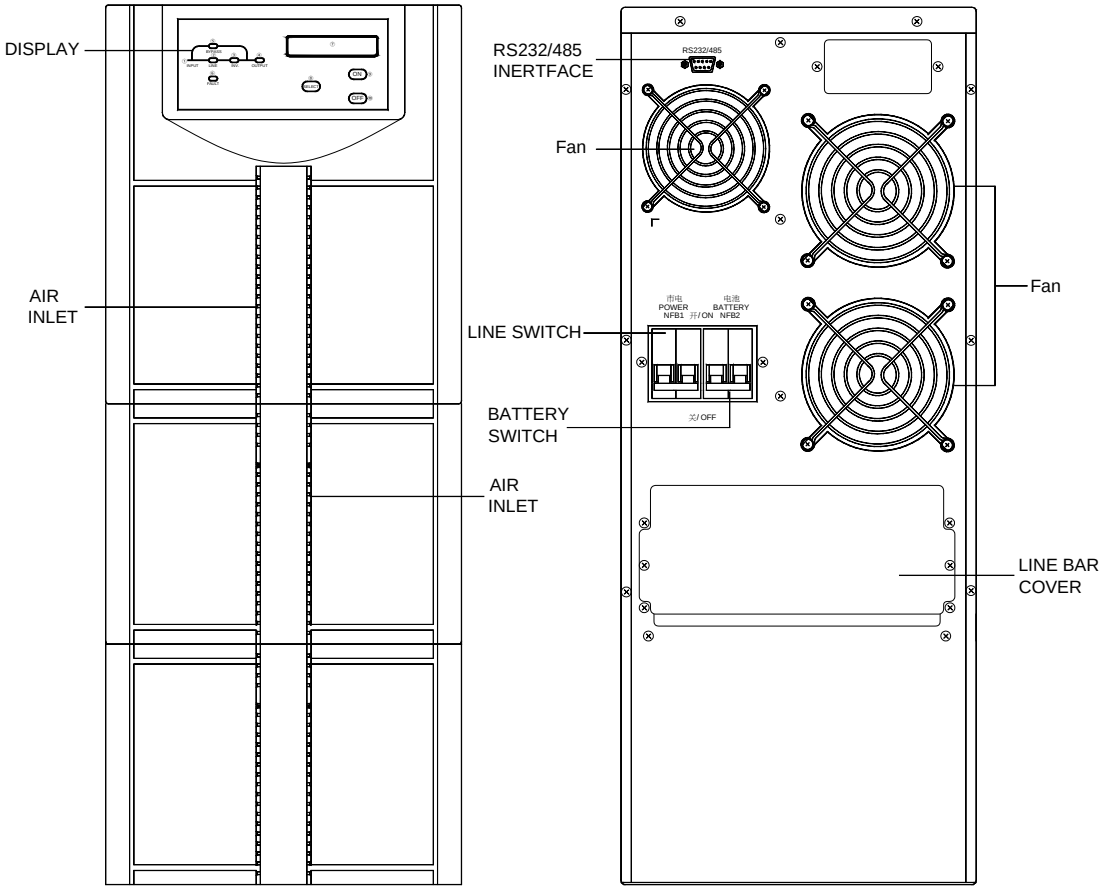

Fig.2-6 DS10KE31L Front Panel and Rear Panel

2.2.3 DS10000E Line bar and Air-break Switch

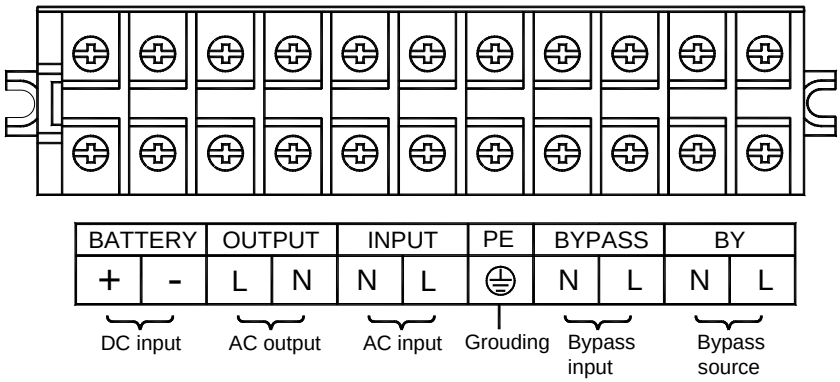

Fig. 2-7 Line Bar of DS10000E

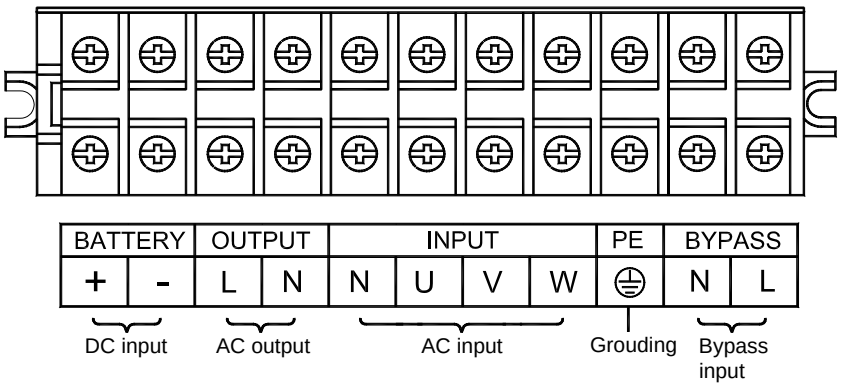

Fig. 2-8 Line Bar of DS10KE31

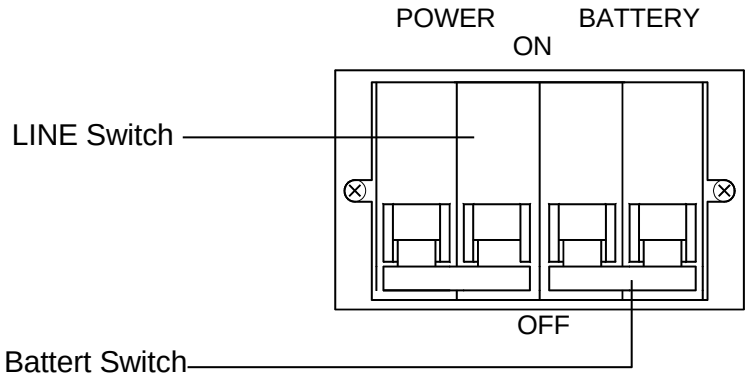

Fig. 2-9 DS10000E Air-break Switch

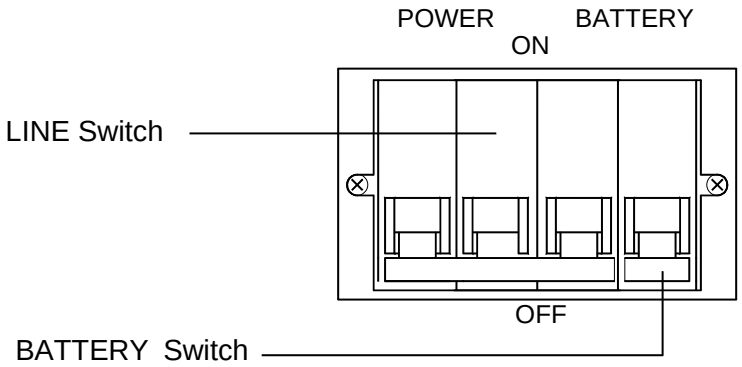

Fig. 2-10 DS10KE31 Air-break Switch

3. Transportation and Storage

3.1 Transportation

During the portage, do strictly comply with the caution brands on the packaging carton to handle the UPS with care and place it in the correct direction to avoid the oscillatory device damage. It is prohibitive that the UPS is positioned in the open car or cabin, mixed with flammable and explosive commodities, parked in open air during the transshipment. No raining, snow or liquor straining and mechanism shattering.

3.2 Storage

The location direction should accord with what shown on the package when the equipment is been stored. The package carton should be blocked up about 20cm and laid at least 50cm away from the wall、heat source、cold source、windows or air entrance.

Keep equipment in dry storage, and prohibit isolation and raining. There should not be kinds of malfeasance gas, flammable, explosive and corrupting chemical material and strong mechanism shock, concussion and strong magnetic field in stocking room. The temperature for UPS storage is 0～40℃。The storage humidity is 20%～80%. The storage period should be 6 months except other regulation. Recheck if the period exceeds 6 months.

4. Installation

4.1 Installation Notice

1. Before the UPS installation, check if the feeding circuit of electric network is clear, including contacts of all the connection points and the sockets are OK, so as to avoid open circuit or short circuit.
2. For the input one-phase-three-lines system, do pay attention to whether the grounding is good and ensure the voltage between zero line and grounding line is less than 5V. If the grounding line is null, the voltage could be 100V. If the user load has strict requirement to voltage between the zero line and the grounding line of the power supply, make sure the grounding of the mains supply is good so as to avoid unnecessary loss.
3. When you are installing UPS, do not reversely or wrongly connect the zero line、caustic line and grounding line of the UPS input and output so as to avoid short circuit and check out if the voltage of the mains supply is normal.
4. If battery group installed for long spare time, do strictly accord with connection method and sequence prescribed by the installation manual to wire and the wiring must be tie tightly. Short-circuit to the polarities of battery and simultaneous touch with any bare party of any two terminals or wire are strictly forbidden or that would result in battery damage or even person injury. When battery group connected to UPS, check if the voltage of battery group coincides with that demanded by UPS.
5. The UPS installation requirement:
   - ◆ Lie UPS on the flat ground (avoid sloping and scabrate ground).
   - ◆ Do not place goods on the UPS nor do the person sitting.
   - ◆ Avoid place such as sunlight、rainy and moist location.
   - ◆ Avoid place where erosive gas included in the air.

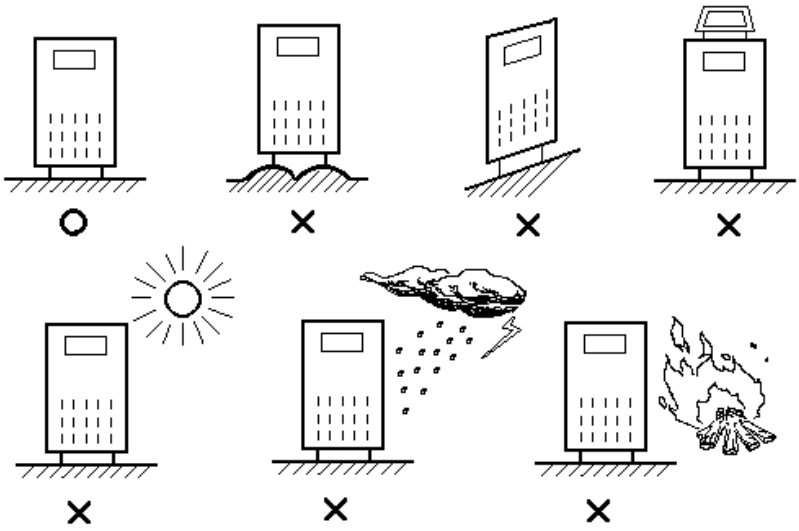

Fig.4-1 UPS placement

4.2 Site and Environment Requirements

4.2.1 Site Requirement

1. Cleanness

   Do not stack sundries and rubbish around the UPS. Unfortunate drop or place of the globule or metal may result in the short circuit which is dangerous to the system and human life security. The dust or sundries in the exhaustion vent may get in the way of air circulation even affect the cooling of the fans, which will result in the system shutdown cause of over-temperature. The civil engineering construction of the equipment room should be completed totally with the floor sclerotic and tidy dry dust-free site.

2. Fire control

   Strictly prohibit the storage of flammable explosive and dangerous commodities in the equipment room.

   To lower the feasibility of fire and the damage resulted from it, in the room where UPS placed, there should be the fireproof material used to the wall、cell and ground and serviceable and valid fire protection equipments configured such as portable CO_2 extinguisher.

3. Ventilation and heat emission

   For the convenience of the operation maintenance and the heat emission of the equipment, there should be clearance about 30～50cm around UPS and 50cm above the top. Exhausting fans should be installed beside the batteries, which have longest

usage under the common temperature（20°C）, to keep the good ventilation of the room.

4.2.2 Environment Requirement

Ambient temperature: 0℃～+40℃；

Relative humidity: 0%RH～95%RH, no condensation;

Cooling mode: air cooling;

Altitude: meet GB/T 7260.3-2003;

Verticality: no shock with orthogonal rake not exceeding 5;

Pollution rank: Class Ⅱ;

The UPS should be installed in the environment where exist enough ventilation, the cool clear air, not too high humidity and no dust. The recommended work temperature is 20~25℃ and the humidity should be controlled around 50%.

Note: Strictly forbid the installation in the environment with dust of metal conduction.

4.3 Unpacking

The UPS and accessories, packaged in carton or wooden crate and carton, should be carefully unpacked and checked whether all are ready or were damaged during the transportation, according to the package list. Make sure that all the accessories have been found before package material cleanliness.

Any emergence, that equipment or some accessory damaged during the transportation or not according with the contact, should be recorded on the spot and reported immediately to the local branch or office.

Check if there is mechanical damage resulting from the transportation when the new product unpacked. If serious damage to appearance have been found, do the further examination.

4.4 Power Examination

Before installation, make sure load capability of electric network satisfies the new equipment requirement and the power accords with the voltage and frequency on the nameplate, if current carrying capability declined cause of the aging of lines. If any doubt, please negotiate the solution with the local mains supply department.

4.5 UPS Installation

Move UPS from carton or wooden crate to the selected location.

4.6 Battery Group Installation

4.6.1 Important Security Regulation

No unclenching or detaching battery, because of that would result in injury to person skin and eye by electrolyte inside them. To avoid electric shock or short-circuit, the following precautions should be strictly complied with when battery changed:

1. No watch, ring or other metal accouterment wore;
2. Use tools with isolated handle;
3. No placement of tools or metal on the battery;
4. No fire is close the battery and no smoking.

4.6.2 Installation Process

1. To achieve safe operation and avoid unnecessary harm to the UPS, all the assembly of outer-placed battery should be executed by the professional technicians and follow the manipulation sequence below:
   a) Complete the wiring among the outer-placed battery groups but temporarily do not connect them to the terminals of UPS.
   b) Connect the input power cable to UPS assuring that the polarity and input voltage accord with the specification.
2. Under the status that the AC input is normal and UPS has no load, turn on the main switch to measure the DC voltage of terminals for outer-battery connection.
3. If the result, gained from step 2, called charge voltage is normal, then connect the outer-placed battery group to UPS. At the moment, confirm that the connection polarity is correct.

4. After assembly and test finished, the UPS can be put into use.

4.7 Electrical Wire Connection

4.7.1 Switch Selection for Input

Before the input coil in of the equipment, install an air switch or a distribution box compliant with the power and capability of the equipment, to isolate it with commercial power. Consider especially the charge power and the current shock, the input air switch can be higher than 1.5-2 times most current of UPS input, which is without creepage protection in order to avoid error action. The distribution box should be better to be manufactured by professional company. Please refer to Table 4-1.

Table 4-1 Recommended Sectional input air switch

	DS10000E、DS10KE31	
	Max. Current（A）	Recommended Air switch（A）
AC Input	78	100
DC Input	55	100

4.7.2 Selection of Input and Output Power Cord Diameter

For the selection of conducting wire sectional area for UPS AC input and output cable and battery cable, please refer to Table 4-2 for corresponding recommended values, and choose values upwards.

Table 4-2 Recommended Sectional Flow of Cable Sectional Area of UPS(mm^2)

	DS10000E	DS10KE31
AC Input（"L" and "N"）	10	10
AC Input（Grounding）	4	4
DC Input("+" and "-")	10	10
AC Output("L" and "N")	10	10

The cable areas above are just the reference for about 5-meter-long line for user. And if the line is longer than 20 meters, the area should be a little larger.

4.7.3 Mode of Single Unit Connection

Insert and screw tightly the going-with power cable and wire into sockets and terminals of the line bar

Note: When wire connected, make sure that the wires and terminals of input and output should be contacted reliably, no disqualified contact and reversed wiring.

4.7.3.1 DS10000E Connection

DS10000E adopts line bar for input and output wiring. Firstly disassembly cover protecting line bar to connect wire. After connection completed, please check if the cables for wiring are correct and firm. If all is right, assembly the cover back to UPS. The cable connection is shown in Fig.4-2 and 4-3 .

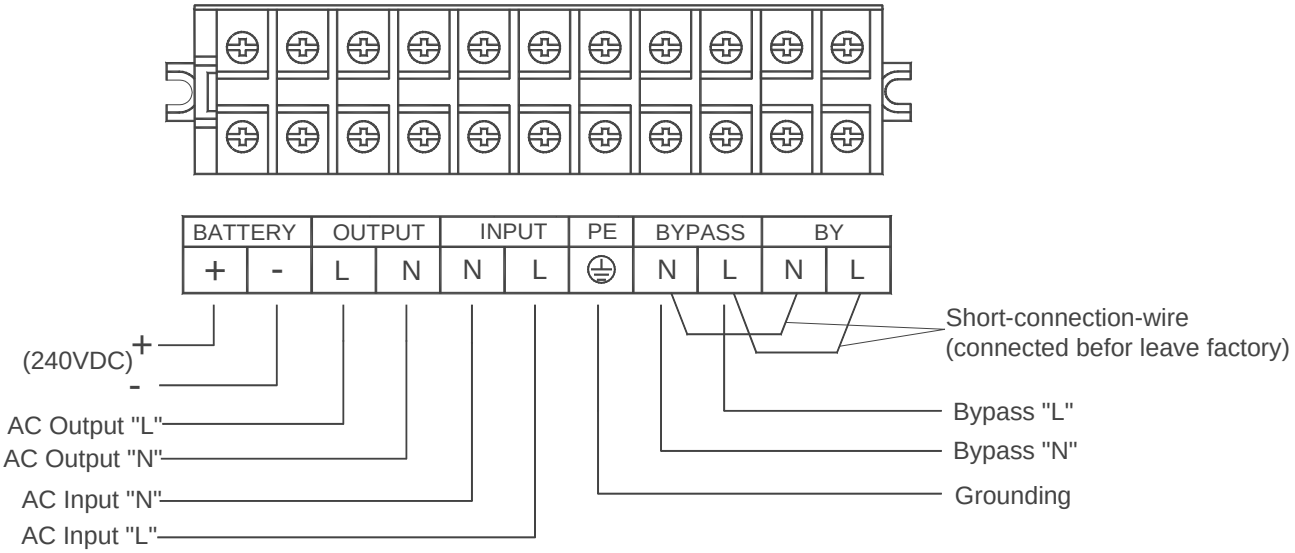

Fig.4-2 DS10000E Mode of Connection

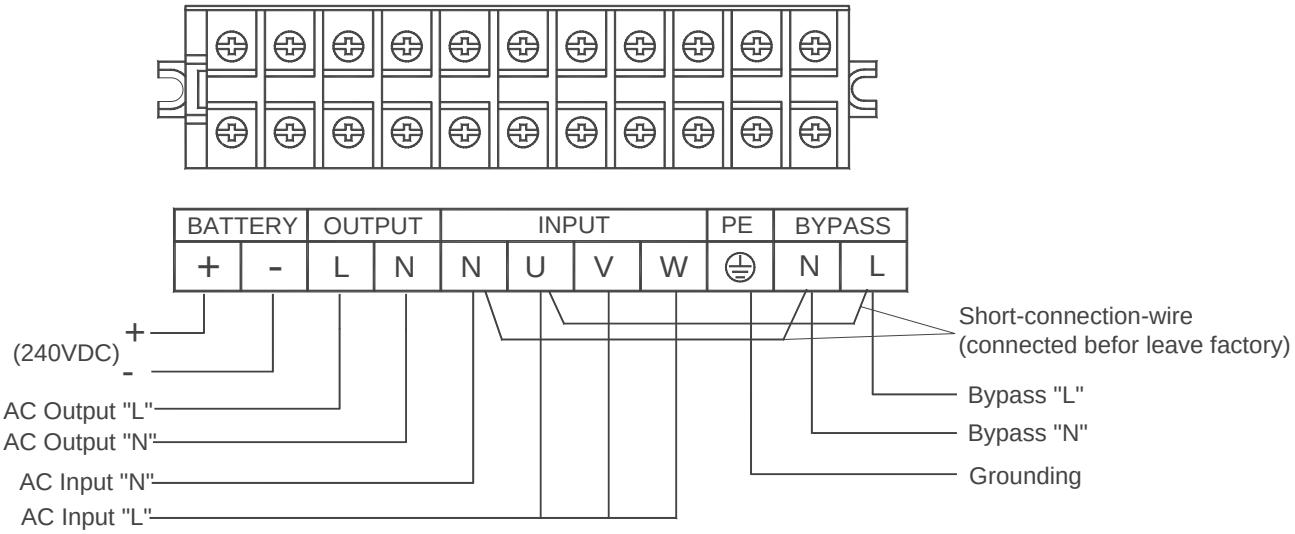

Fig.4-3 DS10KE31 Mode of Connection

4.7.4 Mode of Serial Hot Backup System

4.7.4.1 Connection Procedure

1 First pick off the line bar of main UPS and standby UPS, then remove the side sheet.

2 Remove the line that connect the "L" in the bar signed "BYPASS" and the "L" in the bar signed "BY".

NOTE: In three-phase five-line UPS should remove the line that connect the "JP15（LIN）" in the printed plate signed "TK1110R-GF03" and the "L" in the bar signed "BYPASS"

3 Connect the "L" in the main UPS bar signed "BYPASS" and the "L" in the standby UPS bar signed "OUTPUT" with red line; Connect the "N" in the main UPS bar signed "BYPASS" and the "N" in the standby UPS bar signed "OUTPUT" with blue line;

NOTE: Do not connect "L" with "N"

4 The other connection procedure the same with single unit.

5 Make sure the connection is correct and then fix the decking of the line bar

4.7.4.2 Connection Way

1 DS10000E line connection for the serial hot backup system. the connection is shown in Fig.4-4

2 DS10KE31 line connection for the serial hot backup system. the connection is shown in Fig.4-5

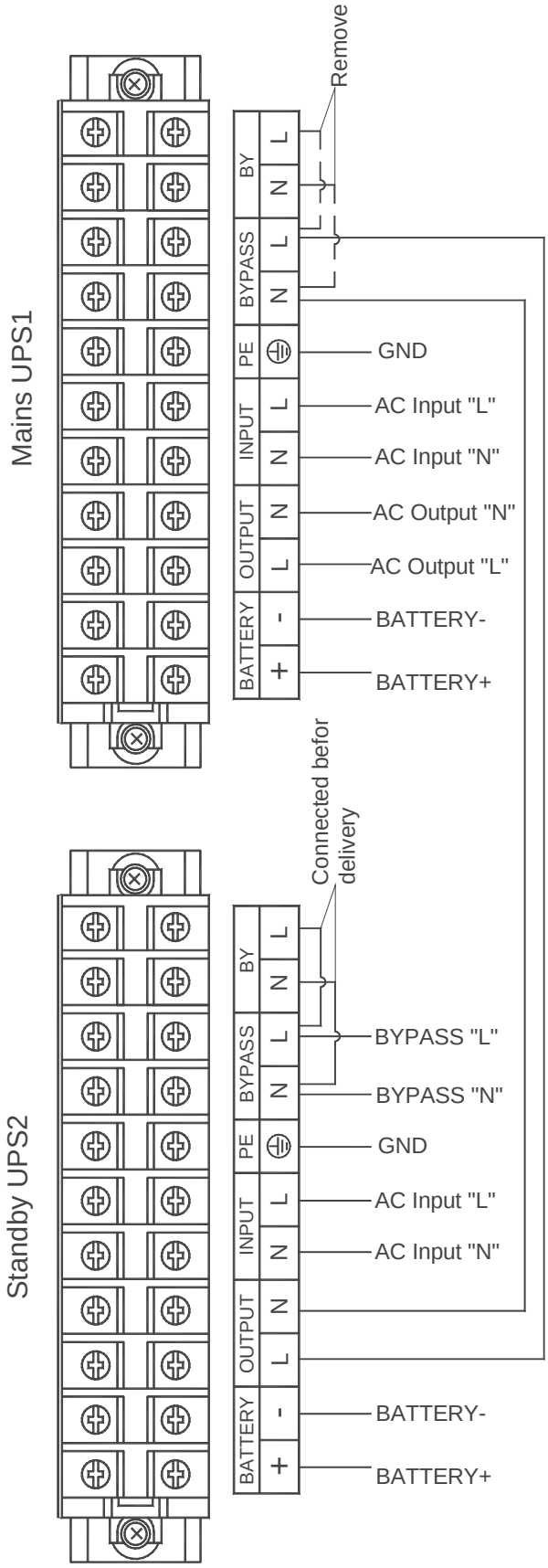

Fig.4-4 DS10000E Cable Connection for the serial hot backup

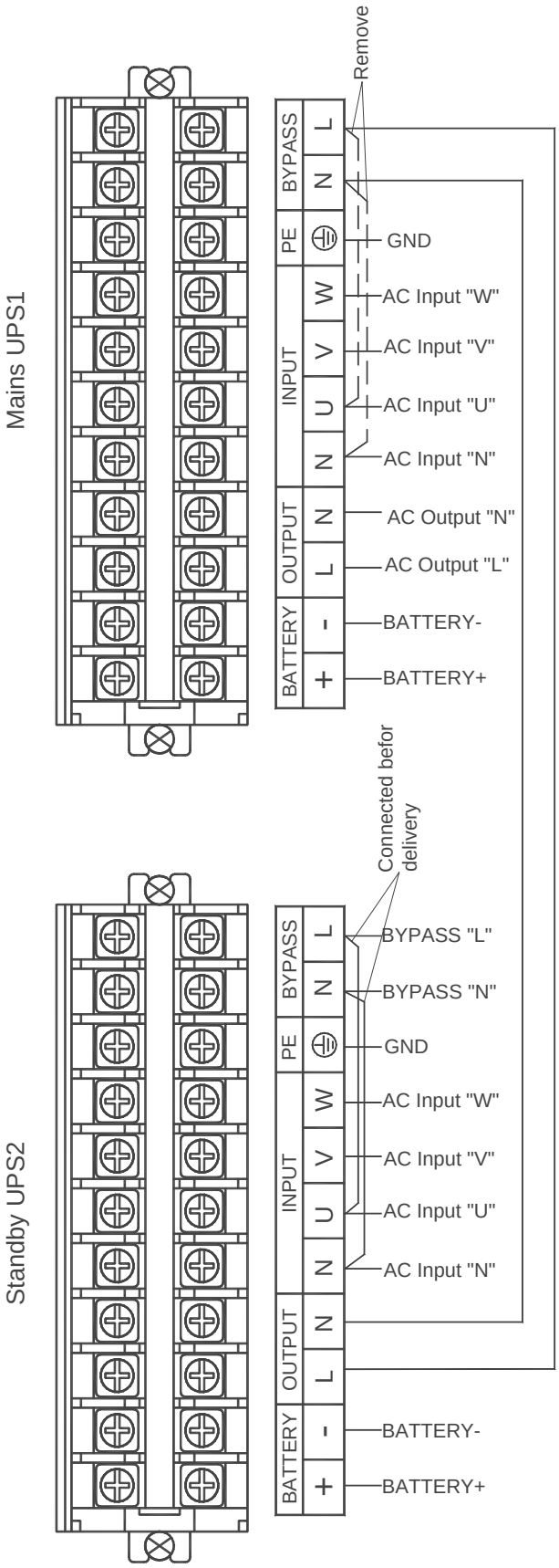

Fig.4-5 DS10KE31 Cable Connection for the serial hot backup

4.8 System Examination

4.8.1 Electric Connection Examination

1 AC input wires examination: check if the colour is normative, the size is proper, the wires have connected to outside control switches, the connections of the caustic line（L）, zero line（N）, grounding wire（GND）are correct and wire connections are firm.

2 AC output wires examination: check if the colour is normative, if the size is proper, if the wires have connected to outside control switches, if the connections of the caustic line（L）, zero line（N）, grounding wire（GND） are correct and if wire connections are firm.

3 The grounding wire examination: check if the grounding wire of the UPS connected to the collecting bar in the apparatus room and the connection is reliable.

4 Voltage which below 5V between the zero wire and the grounding wire examination.

5 If the UPS has installed remote monitor device, check if the correlative connection of the RS232 serial-port is correct.

6 Check if the wiring is regular, cable binding accords with the technical criterion.

7 Check if the installation and wiring is good for the further development, proliferation and maintenance.

5. Operation

5.1 Notice

1. Before the UPS startup, check if the load is proper, which should not exceed the rated power or the status overload protection or all time bypass power supply of the UPS will be brought about.
2. Do not use the switch on the UPS panel as the power switch of the load equipment and strictly refer to the follow sequence to turn on or off the UPS: when startup, firstly turn on the switch on the UPS panel then the equipment's. When shutdown, firstly turn off the switch of the equipment then the UPS. Avoid the frequent startup.
3. Till the UPS startup into steady work status, turn on the load equipments with high-power ones first and low power ones later because the startup current of some equipments are large enough to result in over-load protection (or bypass protection). So it is advisable equipments of this kind should be started up before the others.
4. When the UPS connected to the generator necessary as the mains supply cut off, firstly start the generator, and then switch in the UPS till the generator on steady work status or the UPS or the load equipments may be damaged. In a similar way, disconnect the UPS and the generator before the generator turned off.

5.2 Startup Preparation

5.2.1 Load Capacity Calculation

DS10000E calculates load capacity based on 70% resistance load of nominal rated power. Usually the largest bearable computer load number N is calculated according to the following formulae:

$$\sum_{i=1}^{n} Pi \leq P$$

In the equation, P stands for UPS output capacity (VA), Pi is VA of No. i load.

5.2.2 Checks before Power-on

1. Make sure there is no mistake of the input and output installation.
2. All the breakers are pulled on the "OFF" status.
3. Connect the input terminals to the rated power.
4. Make sure that there is no short-circuit to the UPS output and load capacity does not exceed that of the UPS.
5. Make sure computers or other instruments are off.

5.3 Operation of a Single UPS

5.3.1 First Startup

After confirming all the above, please start the machine by following means:

1. Press "ON" button on the UPS and UPS will slowly startup with indicator "INV." on. In a while, indicator "BAPASS" will go off then UPS will turn into inversion power supply model. At the moment UPS startup completed.
2. Turn on load like computer or other equipment.

5.3.2 Daily Start-up and Shutdown

During daily operation, operate as per the following for start-up or shut down:

1. Press the "ON" button on the UPS panel to start UPS, after 20 seconds, turn on the computer or other instrument.
2. Normally, only when the UPS has been started and is working stably, can the loading equipment power switch be turned on. First turn on high-power equipment, then the equipment with lower power. Some equipment has large start current (such as monitors of some brands). When starting such equipment, overload protection (such as bypass operation) may occur. In this case, it's recommended to start this type of equipment before other equipment.
3. Before shutdown, turn off the computer and other instrument first. Then press the "OFF" button on the panel for 2 seconds.

6. Maintenance Guard

6.1 Battery Maintenance

6.1.1 Daily Maintenance

1. If the equipment has not been used for a long period, start UPS every month to charge battery for more than 4 hours each.
2. Before UPS use, please start up UPS to charge battery for 4 hours, during which UPS can be still useful. But if there is accidence of power broken-down, the discharge period this time will be below standard time.
3. Normally, battery will be charged and discharged every four to six months. First discharge until shutdown then charge. The charging time for standard device should be no less than ten hours each time.
4. At high temperature region, the battery should be charged and discharged once every two months. The charging time for standard device should be no less than ten hours each time.4.
5. Batteries of different capacity, type, and produced by different manufacturers should not be mixed when using.
6. When cleaning battery case, only use wiping cloth and clear water, do not use oil substance or organic solvent such as gasoline and thinner, etc.
7. Battery and battery unit should be kept away from ignition source as well as all electrical equipment that may easily cause spark, to avoid causing unnecessary loss.
8. During the use of battery unit equipped for UPS, regularly check if the charger is in good condition to prevent the battery from being overcharged or undercharged for a long time, and to avoid excessive discharge of battery. After discharging, immediately (no later than 24 hours) perform complete charging, only after then will the re-discharged be allowed. Never re-discharge if the battery is not completely charged, otherwise it will cause decrease in battery capacity or even damage to battery.
9. When not using UPS, please turn off the "OFF" switch on the panel to avoid causing long-time battery discharge after commercial power failure. If the UPS has not been used for a long time, regularly perform charging and discharging of battery to avoid battery damage due to self-discharging.

6.1.2 Battery Changing

1. Do not throw battery into fire to avoid explosion.
2. Do not open or disassemble battery as the electrolyte is harmful to skin and eyes.
3. Properly recycle the battery according to relevant instructions thereon.
4. Replace the used battery with new ones that are of same type and grade.
5. Replace the entire battery unit, do not mix the old ones with the new ones.
6. Dangerous voltage may exist between battery terminal and the ground. Test before touching.

6.2 UPS Maintenance Guide

The correct maintenance, including the preventative maintenance and remedial maintenance, is the key to the best operation and longer usage life of the UPS. The preventive maintenance includes some regular programs to avoid the faults of the power system and reach maximum efficiency. The remedial maintenance includes the probing of the power system fault for the effective maintenance.

6.2.1 Safety Precaution

For safe and smooth maintenance on the power system, you must follow the related safety precautions, prepare the necessary gears and testing equipments and operate under the eligible maintainer's control. Pay attention to the following safety operation regulations:

1. Do remember there always exist hazardous voltage inside UPS even when UPS do not run.
2. Make sure persons manipulating or maintaining UPS are familiar with the manual and instrument.
3. When UPS operation, no golden or sliver accouterments like ring, watch wore.
4. Do assume the safe operation procedure as a matter of course. If any doubt, consult with persons being familiar with the instrument.
5. Keep eye on the hazardous voltage inside the UPS every moment. Using voltmeter to check if the input power is completely cutoff and in safe status before maintenance and adjustability.
6. Please comply with the manual to use UPS. When UPS faults, please cut off

the connection between battery cabinet and UPS immediately then deliver it to professional maintainer or station. Self-deal is prohibited.

6.2.2 Periodic Preventative Maintenance

To improve the efficiency and reliability of the UPS power system, please complete the following preventative maintenance operations:

1. Keep environmental cleanliness to avoid the dust or chemical pollution to the UPS.
2. Examine the input and output terminals every half year to ensure the good contacts.
3. Examine periodically fans working status to prevent sundries to plug up the ventilation. If any damage, please change at the time.
4. Examine periodically the UPS work status.

6.3 FAQ

6.3.1 Abnormal Problem Analyses

If the UPS fails to work properly after starting, please don't jump to the conclusion of UPS failure. Please refer to the following and try to solve the problem.

🕮 **Problem 1**

Power supply is normal; UPS is able to output AC 230V after start, yet in the status of battery inversion.

Possible cause:

Unstable AC power input as a result of poor contact of the junction points, sockets or other connection parts of the electric network feeder circuit connected to the UPS.

🕮 **Problem 2**

After UPS is installed, and after the electric brake or UPS "ON" button is switched on, the fuse will be burnt out or tripping occurs.

Possible cause:

wrong connection of three UPS input wires, for example, zero line or fire wire is connected to UPS earth wire (case）; or wrong connection of three UPS output wires.

🕮 Problem 3

After UPS is started, it outputs AC 230V, yet it's working under bypass status ("BYPASS" keeping lighted).

Possible cause:

Too-heavy load sustained by the device which exceeds rated power of the UPS. In such cases, relieve the load to the UPS, or use a UPS of higher rated power capacity. If it is a temporary bypass status caused by start-up impact of the load, and returns to proper status automatically, that's normal operation.

🕮 Problem 4

Display and output of the UPS are normal after start. However, the output stops as soon as load is connected to it with “INV.” indicator off, “BYPASS” on.

Possible cause:

UPS overload severely or output short circuit. Reduce the load to an adequate amount, or check the cause for short circuit. In many cases, it is caused by output adapter short circuit or input short-circuit fault owing to equipment damage.

🕮 Problem 5

UPS works properly after start-up, and automatically shuts off after a certain period of time.

Possible cause:

Battery group is not charged in time and is working under battery supply status (not powered or not connected to power grid), thus resulting in battery low-voltage protection of the UPS.

Warning: in the case of UPS battery low-voltage protection, please immediately turn off all switches, and restart the UPS and charge the battery to full capacity when power supply recovers. Long-period low-voltage of the battery will shorten the service life of the battery.

🕮 Problem 6

After working for a certain period, with normal input display, the buzzer gives intermittent buzzing and displays battery low-voltage simultaneously.

Possible cause:

AC input voltage is too low, below 120V, to make the UPS work turn into battery inversion model which causes battery low-voltage protection when battery energy used up. It is proper to adopt some way like adding previous AC regulator to increase AC voltage in the acceptable range by UPS.

🕮 Problem 7

UPS is started and working. When power supply breaks down, UPS fails to output power.

Possible cause:

The battery group is not connected to main unit or is severely damaged.

6.3.2 Troubleshooting

6.3.2.1 Overview

In the case of device failure, first of all, find out any obvious damage and try to determine what causes the failure: device problem or external environment (such as temperature, humidity and load). Always check these external factors before coming to the conclusion of UPS system damage.

6.3.2.2 Troubleshooting

Only some simple troubleshooting suggestions are provided here. If the diagnosis result is not certain or the information given here is not sufficient for problem-solving, please turn to your local office or distributor for repair.

1. Buzzer gives long buzzing, "FAULT" light is on, UPS is powered through bypass, and inverter fails.
   Possible cause:
   ①Output overload or short circuit results in UPS automatic shutdown protection;
   ②Driving or power tube malfunction;
   ③UPS Over-temperature protection;
   ④Master control board failure.
2. UPS works properly when power supply is O.K., but it fails to function during power failure.
   Possible cause:
   ①Battery failure.
   ②Battery charger malfunction: Fail to charge battery when power supply is O.K.
3. Intermittent buzzing of the buzzer when UPS input is normal.
   Possible cause:
   The voltage from commercial supply is too low, below 120V.
4. UPS works well when computer is in operation. After power failure, UPS works properly and the computer breaks down.
   Possible cause:
   Poor grounding connection as a result of much too high float-charge voltage

of the zero line and earth wire.

5. All of panel indicator lamps are off.

   Possible cause:

   Poor connection or malfunction of display control panel.

6. UPS is normal with no load but it faults once it start up with load, turning into bypass power supply.

   Possible cause:

   Maybe one of IGBT driver signal lost.

6.3.3 Emergence Measure for Single System

In case of fault appearing in the single system, press "OFF" on UPS panel to shut down UPS. If necessary, cut off user load and switch of input and output to protect UPS from further damage.